v.14 #9

The MONTHLY REVIEW

Published Monthly by the

American Electroplaters Society

A SOCIETY FOR THE ADVANCEMENT

OF THE

SCIENCE OF ELECTROPLATING

SEPTEMBER, 1927

KRESGE-HOOKER SCIENTIFIC LIBRARY

Entered as second-class matter, September 3, 1926, at the Post Office of Chicago, Ill., under act of August 24, 1912.

Acceptance for mailing at special rate of postage, provided for in section 1103, Act of February 28, 1925, authorized September 3, 1926.

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After November issue of Review the Directory on page 24 of Review will be discontinued monthly and will only appear thereafter in the August and February issues, so keep these corrected.

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MONTHLY REVIEW

Published by the

American Electroplaters Society

Publication and Editorial Office

3040 Diversey Ave., Chicago

VOL. XIV SEPTEMBER, 1927 No. 9

EDITORIAL

To the Officers and Delegates assembled at the 15th Annual Convention,

Greetings:

After reading the Financial and Membership Report of this office for the past year, a copy of which has been sent to all secretaries and also to each delegate, you perceive that the Supreme Society has had a fairly good year.

At the last convention it was ordered that the secretary find out what it would cost to furnish each branch with a copy of the "Proceedings of the next convention," we have compared the cost of the last four conventions and find that if we deduct the average rate that has been charged us in the past from the bids received this year, we can furnish each branch (22 branches) with a copy @ $3.50 per copy, and the Supreme Society at the same cost previously paid will receive 8 copies instead of 2 copies, and will be able to furnish each Executive Officer with a copy.

During the past year there were only three branches which made a call for constitutions, we believe every branch should see that a new member elected gets a constitution and a membership card.

As regards membership cards, two branches did not take their 1927-1928 cards which means that the members of these branches do not have an official 1927-1928 card.

The Secretary recommends that each Branch get out a list of the names of the firms employing our members, so that these firms can be notified of our Annual Conventions from this office.

We also recommend that a committee be appointed to revise the Constitution and have some printed, as our supply is exhausted.

In reference to the Employment Bureau, we believe this work could be greatly improved by having proper forms printed so that both members and manufacturers could state their requirements in detail, and the same would save a lot of unnecessary correspondence and time of the manufacturer and the members, thereby making this service more efficient.

Respectfully Submitted,

Geo. Gehling, Secy.-Treas.

PAPER ON CHROMIUM PLATING

Presented by C. VanDerau

Annual Convention of
American Electro-Platers' Society
Toledo, Ohio, June 30, 1927

Chromium Plating

In the last few years considerable attention has been given, by almost every manufacturer, to the problems and possibilities of commercial chromium plating.

The possibilities of chromium plating are of far reaching importance, entering into the fields of the following industries:—ceramic printing, machine tool, oil, leather, soap, paper, plumbing, automotive, and all lines of rust resistant and ornamental finishing. A glimpse at the above field should stimulate the electroplater to greater activity in the development of chromium plating.

The present interest in chromium plating would lead one to believe that it is a new discovery, but chromium was deposited electrically as far back as 1854 by R. Bunsen. Continuation of this interest by the various industries, chemists, and electroplaters should change the status of chromium plating from an art to a science, thereby making it possible to chromium plate on as large a scale as that of nickel, silver, copper, and other plated metals.

The characteristics and properties of chromium as taken from the Chemical Rubber Company's *Handbook on Chemistry and Physics* are as follows:

Specific gravity—6.92.
Melting point—1305° Centigrade or 2741° Fahrenheit.
Boiling point—2200° Centigrade or 3992° Fahrenheit.
Specific Heat—.133 at 400° Centigrade.
Atomic Weight—52.

Electro Positive Potential—.650.

It is a very highly crystalline, brilliant silvery metal, very hard and brittle, and is not attacked by oxidizing acids such as nitric or sulphurous vapors. The above characteristics indicate the value of chromium for wearing, protective, and ornamental coatings. Chromium resists practically all acids with the exception of Hydrochloric acid, in which it is readily dissolved. This factor makes it possible for the electro-plater to salvage any defective chromium plate parts.

The idea of this paper is to give members of the American Electro-Platers' Society the date gathered from the past year's experience on chromium plated flood light reflectors and electrical appliances.

The following process has been worked out and is used on reflectors:—

(1) Clean in an alkali solution to remove soap and grease used in the spinning or drawing operation. Rinse in cold running water, and bright dip in a solution of sulphuric and nitric acids to remove scales from the surface of brass or copper material. Rinse in cold and hot water to remove acid.

(2) Polish reflectors on sub-felt, sewed muslin, or sheepskin wheels at a peripheral speed of 4000 to 5000 ft. per minute, wheels set up with two or more coats of glue and 160 Turkish emory to remove imperfections such as spinning marks, die marks, and material pits. (Note: 180 Turkish emory cake and grease stick compounds used on polishing wheels.)

(3) Buff out polishing marks on loose or bias muslin buffs at a peripheral speed of 4000 to 6000 ft. per minute. (Note: Tripoli, silicate and lime buffing compounds used in buffing operation.)

(4) Color buffing of reflectors should be done on loose muslin or cotton flannel buffs running at a peripheral speed of 3000 to 4000 ft. per minute to remove buff stop and finger marks. (Note: Lime buffing compound used in this operation.)

(5) Rack and place in soap cleaner tank from 1 to 3 minutes to remove buffing compound, using cotton mop if necessary. Rinse in cold water. Immerse in sodium cyanide dip to remove alkali tarnish. Place in mild electro copper cleaner, not to exceed 1 minute at 6 volts. Rinse in cold water. Place in nickel bath from 5 to 15 minutes at a current density of 2 to 10 amperes per square ft. at 2 to 3 volts. Rinse in cold water, and change to a special chromium plating rack. Then place in chromium

plating solution over an inverted lead anode from 1 to 10 minutes at a current density of 50 to 500 amperes per square ft. at 4 to 12 volts. Rinse thoroughly in cold running water. Before giving reflector the final rinse in clean hot water dry reflectors in sawdust to prevent excess water strains.

(6) Color buff chromium plated reflectors on loose muslin or cotton flannel buffs running at a peripheral speed of 3000 to 4000 ft. per minute to remove water strains and any irregularities of chromium deposit. (Note: Chrome green oxide in stick or liquid paste form is used as a buffing compound.)

Chrome oxide buffing compound can be bought from several plating supply houses. Chrome oxide paste formula is as follows:

Denatured alcohol—50%.

Glycerine—5 to 10%.

Naptha—40 to 45%.

Dry chrome oxide—approximately 8 oz. to the gallon of the above solution.

This paste makes a splendid color buffing compound for producing a high, clear luster on bright chromium finishes.

(7) Inspect reflectors or any other parts under a screen of white tissue paper using a 150 watt lamp or bright daylight. Irregular plating will show up in this light, nickel appearing very yellow, as against a deep blue of chromium.

Several types of plating solutions have been used and data gathered over a period of several months. Solutions tested are as follows:

No. 1 Solution.

Commercial chromic acid—30 oz.

Water—1 gal.

This solution gave fair results, but required very high current densities, had very little throwing power, and was impractical for small parts.

No. 2 Solution.

Commercial chromic acid—28 oz.

Commercial chromic sulphate—½ oz.

Commercial boracic acid—1 oz.

Water—1 gal.

This solution had greater throwing power and gave a brighter and bluer finish. Boracic acid seems to be an important factor, as several times when chromic acid content was running low and throwing power was weak, an addition of 1 or 2 lbs. of boracic

acid to a hundred gallons of solution gave it new life and permitted working until the end of the day. Boracic acid apparently works about the same in chromium solutions as it does in nickel solutions, producing a finer grained deposit at the cathode.

No. 3 Solution.

Commercial chromic acid—60 oz.

Iron chromate—2 oz.

Water—1 gal.

Number 3 solution has given the best results. The addition of iron chromate has permitted the use of much lower current densities, thereby making it possible to chromium plate for any desired length of time; also making it possible to balance labor cycles. Parts have been plated for several hours in this solution with apparently no treeing action on the edges; also chromium has been plated over chromium without any tendency to peel. Reflectors that require 400 to 500 amperes in No. 1 and No. 2 solutions can be plated in this solution at 50 to 100 amperes. This comparison shows that No. 3 solution has much greater throwing power.

It is essential that chromic acid content in any of these solutions be above 20 oz. per gallon, although we have let chromic acid content drop as low as 12 oz. per gallon. At this point it was difficult to obtain a satisfactory chromium deposit. We are not in a position to state what we think is the high limit of chromic acid as we are obtaining satisfactory results at 60 oz. per gallon and believe that we can go higher in chromic acid content.

Chromic sulphate should not be added after the solution has been made as there is enough sulphate carried into the solution with the commercial chromic acid, as it contains about 1% sulphate. During a six months' test period, chromic acid content ranged between 40 and 60 oz. per gallon, while chromic sulphate ranged between .7 oz. and 2 oz. per gallon.

Chromic sulphate content in the three types of solution has shown the same tendencies to hold within the above limits. This leads us to believe that there is no necessity for extra additions of chromic sulphate to the plating solutions. Additions of chromic acid are governed entirely by the volume of work plated, all metal being taken from solution. Commercial chromic acid is approximately 50-51% metallic chromium.

We are not in a position to state what limits or additions of iron chromate are necessary, but believe that the content can go

above 2 oz. per gallon without any serious results. Apparently the three most important factors in chromium plating solutions are chromic acid, chromic sulphate and iron contents.

It is absolutely necessary to determine additions to chromium solutions by analysis in order to get satisfactory results, although it may be possible to use a hydrometer to maintain the proper solution densities. The following method of analysis is used.

Analysis of Chromium Plating Solutions

Dilute 25 cubic centimeters of the plating bath to 500 cubic centimeters and use portions of this *diluted sample* for the determinations to be made. .

Sulphate—SO_4

Place a 100 cubic centimeter sample in a 250 cubic centimeter beaker; add 8 to 10 cubic centimeters of concentrated hydrochloric acid (HCl) and 5 cubic centimeters of redistilled denatured alcohol; boil for one-half hour. This reduces the hexavalent chromium to trivalent and permits the precipitation of sulphate by barium chloride without contamination by barium chromate, which would occur to some extent even in hydrochloric acid if the chromium were not reduced. Make up to 150 cubic centimeters with hot water; bring to a boil, and add 10 cubic centimeters of 10% solution of barium chloride drop by drop, stirring the solution meanwhile. Allow the solution to boil a few minutes; then set the beaker on a hot plate where it will be at a temperature of about 60° Centigrade. Let stand 36 hours. Filter on a tight ashless filter paper; wash until free of chromium with a solution containing 10 cubic centimeters of 10% barium chloride and 10 cubic centimeters of hydrochloric acid per liter; then wash 5 times with a 1% by volume hydrochloric acid solution to remove the barium chloride ($BaCl_2$) remaining in the paper. Ignite and weigh as barium sulphate ($BaSO_4$). This weight x 82.3 equals SO_4 in grams per liter of plating bath. This factor for barium sulphate ($BaSO_4$) to sulphate (SO_4) is .41155. The sample is 1/200 of a liter of plating solution, therefore .41155 x 200 equals 82.3.

Chromic Acid—CrO_3

Measure 10 cubic centimeters with a carefully calibrated pipette into a 600 cubic centimeter beaker; add 10 cubic centimeters of 50% sulphuric acid (H_2SO_4) solution and dilute to 500 cubic centimeters with cold water. Run in a solution of approximately 1/10 normal ferrous ammonium sulphate (40 grams

plus 80 cubic centimeters of 50% sulphuric acid solution made up to 1 liter) from a burette until there is a slight excess. Use potassium ferri cyanide as an external indicator. Titrate the excess ferrous sulphate with 1/10 normal potassium permanganate solution. The deep green color of the reduced chromium makes the end point a little difficult to recognize, but after a few titrations the operator should have no difficulty. The clear green of the chromic ion changes to a violet shade at the end point; when this is reached one drop excess of the permanganate will give the solution a distinct purple cast.

The 1/10 normal value of the ferrous sulphate must be found each time chromic acid content is determined by titration against a 1/10 normal potassium permanganate solution.

Calculation of Chromic Acid (CrO_3): The number of cubic centimeters of 1/10 normal ferrous sulphate used minus the number of cubic centimeters of 1/10 normal potassium permanganate used to come back equals the number of cubic centimeters of 1/10 normal chromic acid (CrO_3) in the sample titrated; this multiplied by .00333 (equals grams or chromic acid per cubic centimeter of 1/10 normal solution) gives the weight of chromic acid (CrO_3) in 10 cubic centimeters of the sample; and this weight multiplied by 2000 gives the chromic acid (CrO_3) in grams per liter of the plating bath.

Trivalent Chromium—$Cr+++$

The size of the sample to be used depends on the amount of trivalent chromium present; this can be fairly well gauged by the color of the diluted sample; a clear yellow color indicates low trivalent chromium content—use 100 cubic centimeters of sample; a dark orange color shows a medium amount of trivalent chromium—use 50 cubic centimeter sample; while a dark red color shows high trivalent chromium content—use 20 cubic centimeter sample. The reason for limiting the size of the sample is that an amount of trivalent chromium weighing more than .040 grams when ignited to chromi trioxide (Cr_2O_3) is too bulky to be readily filtered when precipitated as chromium hydroxide ($Cr(OH)_3$).

Dilute the sample to 100 cubic centimeters in a 250 cubic centimeter beaker; add 25 cubic centimeters of 50% by volume hydrochloric acid solution and 30 to 35 cubic centimeters of 50% ammonium hydroxid solution. Boil until the ammonium-chromic-hydroxide complex is broken up and all chromium is precipitated as chromium hydroxide—$Cr(OH)_3$. This requires one half hour

boiling and the solution must be kept distinctly ammoniacal the whole time, adding a few cubic centimeters of 50% ammonium hydroxide as needed. Let the precipitate settle a few minutes and filter. Wash 2 or 3 times with a slightly ammoniacal solution of ammonium chloride (1% NH_4Cl). It is practically impossible to wash this precipitate free of ammonium chromate so it is necessary to re-precipitate. Reject the filtrate and place the original beaker under the funnel and dissolve the chromium hydroxide ($Cr(OH)_3$) on the paper by washing with 50 cubic centimeters of hot hydrochloric acid (1 volume of concentrated hydrochloric acid to 2 volumes of water). Wash paper with hot water or 1% hydrochloric acid till the volume in the beaker is 150 cubic centimeters; add 30 cubic centimeters of 50% ammonium hydroxide by volume; boil one-half hour as before; filter and wash; ignite and weigh. This weight will give R_2O_3—(that is Cr_2O_3 and any Fe_2O_3 that may be present). Subtract from the R_2O_3 the weight of Fe_2O_3 (as determined below) to get the weight of Cr_2O_3. The factor of Cr_2O_3 to chromium is .6842; if chromium is determined in a 100 cubic centimeter sample, which is equivalent to 1/200 of a liter of plating solution, then .6842 x 200 equals 136.8, the factor to convert trivalent chromium to grams per liter.

Iron—Fe.

To a 100 cubic centimeter sample add 60 cubic centimeters of bromine water (made by shaking a few cubic centimeters of bromine in a glass-stopped bottle with water), then add 15 cubic centimeters of sodium hydroxide solution (5 cubic centimeters having 1 gram of NaOH) boil ½ hour. Trivalent chromium is oxidized to hexavalent and iron is precipitated. If the precipitate is black instead of red, copper, nickel, or manganese is present (generally copper), cool to about 50° Centigrade and filter; wash 2 or 3 times with dilute (1% NaOH) and dissolve the precipitate with hydrochloric acid (1 volume of acid to 2 volumes of water) as under trivalent chromium; wash. Make the solution ammoniacal; bring to boil; filter and wash. Ignite and weigh as Fe_2O_3. Copper has been eliminated by precipitation with ammonium hydroxide.

Copper—Cu.

If this determination is desired it is well to take a 200 cubic centimeter sample; reduce the chromium with hydrochloric acid and alcohol (10 cubic centimeters) as under the sulphate determination. Neutralize excess hydrochloric acid (HCl) with ammonia and then make the solution acid with hydrochloric acid so

that there is 1 cubic centimeter of free acid per 100 cubic centimeters of solution, the volume of the solution should now be about 300 cubic centimeters. Pass in hydrogen sulphide for ½ hour; warm; transfer the sulphides from the paper into original beaker; dissolve in nitric acid and evaporate to fumes with 5 cubic centimeters of 50% sulphuric acid by volume; take up in water; note if any lead sulphate has appeared and filter if there is any. Weigh as $PbSO_4$. Add 1 cubic centimeter of nitric acid to solution and determine copper by electrolysis. If electrolysis is not possible, the copper sulphide precipitate may be ignited and weighed as copper oxide (CuO). This, however, gives somewhat high results. The object of reducing with alcohol before passing in hydrogen sulphide is to escape the separation of a large amount of sulphur by reduction of chromic acid by hydrogen sulphide.

Temperatures of solutions must absolutely be controlled. A solution run between 115° Fahrenheit—130° Fahrenheit produces the best results on reflectors. When the temperature is below 110° Fahrenheit smutty and velvety deposits are obtained, in some cases having the appearance of being badly burnt, particularly at the edges. When the temperature of solutions is above 135° Fahrenheit, they lose throwing power even though current densities remain the same. Deposits at high temperatures are very light and bright. This information was gathered by running solutions from room temperatures up to 180° Fahrenheit trying to find the workable limits.

Considerable thought should be given to facilities for current control. Three wire plating generators are more suitable for chromium plating, making it possible to use a double throw switch, giving a choice of either 6 or 12 volts depending upon the size of the article being plated.

Racking presents one of the big problems and the plater must forget the easy methods of wiring, hooking, and racking used in other lines of plating when he enters the field of chromium plating. Large pieces of work present less racking difficulties than smaller parts. On reflectors, lamp rings, radiator shells, etc., it is possible to use racks which clamp on either inside or outside of the rims making a contact on at least 75% of the circumference or perimeter, thereby having a tendency to uniformly distribute the current which gives more uniform deposits of chromium. When parts do not lend themselves to this kind of racking it is necessary to move the hook or wire to insure a chromium plate

under the contact point. Racks should be made of copper buss bars or rods to facilitate the carrying of high current.

Many parts require special anodes and best results are obtained when the area of the anode surface is slightly less than the cathode surface. On relatively flat work this is not so important. Steel or lead may be used for anodes, lead being the most flexible for adjustment. Anode and cathode rods should be connected to buss lines with flexible cable so that the proper spacing between anode and object being plated can be obtained. Different shaped pieces require special adjustments between the anode and cathode.

Steel, crockery, or lead lined tanks can be used for chromium solutions. Lead coils should be used for steam and water, as iron pipe gives up in plating solution. Due to the excessive amount of fumes liberated by chromium solutions, it is absolutely necessary to provide ample hoods and ventilating facilities to protect the operators as the fumes attack the membranes of the nose and throat causing bleeding of the nose and excessive coughing.

In summing up the variables of chromium plating, it is necessary to recognize the fact that chromium plating is an engineering proposition requiring more definite methods and standardization than any other known form of electro-plating.

C. VANDERAU,
Supervisor of Finishes, Westinghouse Elec. & Mfg. Co.,
Mansfield, Ohio.

THE PRODUCTION OF A RUST-PROOF ANTIQUE FLEMISH IRON FINISH UPON WROUGHT IRON, CAST IRON, MALLEABLE IRON, STEEL, OR IMITATION THEREOF UPON NON-FERROUS METALS

By Charles H. Proctor

Thirty or more years ago wrought iron was very much in vogue with its incidental Flemish Iron Antique Finish applied; the quiet beauty and richness of the finish, when correctly applied, is unsurpassed by any other finish applied to a metal surface.

History but repeats itself in the production of metal finishes; so today we find that wrought and flemish iron finish is much in vogue, metal goods in endless variety from chairs and benches to builders' hardware, electric lighting fixtures and bric-a-brac being fashioned from wrought, and cast, and malleable iron in endless artistic designs.

Iron, steel, cast iron, and malleable iron are very susceptible to corrosion resulting in rust unless the surface of the articles finished in the Flemish iron finish is amply protected with suitable lacquers adapted to polished iron or steel surfaces. Even with this precautionary measure it has been found that when the finished product is carried in stock for any length of time—especially near the seacoast or in damp or humid atmospheres—although amply protected with outer wrappings the surface of the finished iron products will rust. Many manufacturers have failed to realize that if after lacquering the surface of such products a thin coating of bees wax dissolved in pure turpentine, reduced to a paste, was further applied and wiped with soft cloths, they would have then produced a moisture-protected surface that would not rust, especially so if the first paper wrappings were impregnated with paraffine wax such as commonly sold under the commercial term of waxed papers.

One of the best fluid wax pastes that I have experimented with is known as "Johnson's Floor Wax." Articles made from sheet steel, such as the tops of electric ranges, and finished in brush nickel, when coated with this wax, have been immersed in water for months without rusting of the surface.

As a positive rust-proof factor for products made from gray iron steel and malleable iron, when finished in the Flemish iron finish, I developed for the manufacturer of fire-place heaters, hand irons, etc., a rustproof finish that in the author's opinion will not rust when the articles are carried in stock or are in constant daily use, if a thin coating of fluid wax is applied at intervals to the surface of the finished product, as the housewife does to her furniture to maintain its luster and finish.

The methods in vogue for the production of Flemish Iron Finish depend to a great extent upon the basic metal surfaces. For cast and malleable iron surfaces, which have indentations and designs cast in them, all that is necessary is to soften up the surface of the iron by the usual iron pickles of hydrofluoric acid, if there is burnt-in sand in the surface of the iron, or hydrochloric acid if there is only a hard skin surface.

These pickles should be used hot; one part hydrofluoric acid and six parts water, headed to 140° Fah., makes an effective sand-removing acid pickle. Hydrochoric acid pickles

are best prepared from equal proportions of acid and water, or one part acid to two parts water heated to 140° Fah. The heating of acid pickles makes them more active, therefore the time of the immersion of the metal articles in the acid pickles is considerably reduced, and more dilute pickles can be used to an advantage.

After pickling the iron articles should be thoroughly washed in water and then immersed in boiling water to which is added one ounce of tri sodium phosphate, soda ash, or aqua ammonia, per gallon of water.

The alkalis neutralize the acid in the pores of the metal and prevent rust during final manipulations.

After thoroughly drying, the surface of the iron may be roughed out, with 60 or 80 emery. The articles should then be immersed in a dead black air drying or baking japan, or airsprayed, and then dried according to the respective materials used. When the black finish so appled is hard and dry, the final polishing operation can be applied, which may vary from 120 to 180 emery finish.

The second polishing operation removes the black japan from the high lights, leaves it in the backgrounds and gives the antique or Flemish iron effect.

The surface of the iron should be thoroughly dusted from emery dust, preferably by air blast, to remove the polishing dust from indentations, then wiped with cloths moistened with benzine, benzole, or lacquer, thinner to remove grease, then lacquered as usual and finally wax-coated.

Some firms have adopted the method of nickel-plating the various iron articles; then, after polishing, they apply the antique black finish with black nickel solution, or iron and arsenic acid solutions, but such deposits do not prevent rust. Others apply pigment blacks and relieve the surface; as may be found desirable, the pigment blacks are either applied before or after the surfaces of the articles have been lacquered.

Black pigments that have no dissolving action upon the lacquers are best applied after lacquering; because of being of a semi-oily nature they can be readily removed with cloths moistened with a mixture of linseed oil and turpentine when the black is partly dry, without any reducing action upon the

lacquer. All that is necessary is to see that the high lights are clean.

Articles made from bright cold-rolled steel which have the hammered indentations made mechanically, are best treated by the latter methods: Polish first; then lacquer; then apply the blacks and relieve as outlined.

It was, however, in order to eliminate the application of electro-deposited blacks as well as pigment blacks in the production of the wrought iron or Flemish iron finish that the author developed the new rust-proof finish, as applied to the sample cast iron book-rests I present to you for examination.

The method of procedure in the production of the finish is as follows:

The articles should be acid-pickled or sand-blasted and, if necessary, polished down to the desired surface with usual emery polishing, then cleansed as usual, and then plated in cadmium solution.

The solution consists essentially of a cadmium mercury alloy, the mercury being alloyed with the anodes upon the basis of one to two per cent mercury with the metallic cadmium.

Water	One gallon
Sodium cyanide	96-98%, 7 ozs.
Cadmium oxide	3 ozs.
Caustic potash	2 ozs.
Black molasses	1 oz.

Anodes: 90% cadmium, 2% mercury; voltage 4 to 5; Amperage 10 to 25 per square foot of surface area; temperature of solution: 110° Fahr.

It has been found advisable to use about 20% of the total anode surface required of sheet steel or durion, so as to avoid an excessive building-up of metal in solution.

The steel or durion anodes fill the gaps between the anodes and therefore produce a more equal distribution of the current and deposited metal without excessive metal reduction.

The upkeep of this type of cadmium solution is very low in cost, whether used as a basis for commercial cadmium deposits in the protection of steel products from rust and corrosion, or in the production of the rustproof Flemish iron finish referred to.

If the water line is maintained constant, an addition of one-eighth of sodium cyanide and one thirty-second (1/32) ounces of caustic potash per gallon of solution per day will maintain it in constant operation. When barrel plating is used, the proportions of cyanide required may reach a maximum of one-half ounce per gallon with one-eighth of caustic potash.

These additions, however, can be best determined by current control; cadmium solutions should always be controlled by volt- and ampere-meters to produce standard results at the minimum cost of metal required and with a minimum of time. Create a standard and maintain it if you want uniform results.

Oxidizing Solution for Antique Flemish Iron Finish

After the iron or steel articles have been Cad-A-Loy plated as outlined, for a definite period of time to produce at least one to three ten-thousandth (1-3 10/1000) of thickness of Cad-A-Loy per square foot of surface area, which should be readily produced in ten to fifteen minutes' time, if the maximum of current is used, wash the plated articles thoroughly in cold water, after cadmium-plating, then immerse direct in the oxidizing solution prepared as follows:

Water .....1 gallon
Hydrochloric acid .....5 ozs.
Platin-Nig .....¼ oz.

Temperature of solution, 120 to 140° Fah.; time of immersion of the Cad-A-Loy plated product, one to two seconds.

A deep black oxidized finish will result. The articles should be rewashed thoroughly in cold and boiling-hot water, they are then ready for the final finishing.

Finishing

The surface of the articles should now be scoured down with pumice stone mixed with water to a plastic mass. The scouring wheels may be either tampico, or made up from individual sections of buff cloth not more than six to eight inches in diameter; the speed of rotation should be kept down as low as possible, 500 to 600 R. P. M.

The oxidized black is quite soft, so does not require much friction or pressure to remove the excess from the high lights. After finishing as outlined, wash and dry out the articles as usual.

The articles are then ready for lacquering by either dipping or spraying. A good grade of brush brass lacquer, of any desired manufacture, should be used. After the lacquer is hard and dry a very thin coat of wax should be applied as a further added finish and protection.

The finish thus produced will result in an ideal Flemish iron finish that will be rustproof and artistic and save the application of pigments or japans in the production of the antique black finish, so much admired in the Flemish iron finish.

I might mention in closing that Platin-Nig is the well-known oxidizing agent at present so universally used in the production of antique and Dutch silver finishes, so much in vogue in commercial art.

NEW YORK BRANCH

The two meetings of the New York Branch were held July 8th and 22nd. These were presided over by our vice-president, Mr. A. Grinham, on account of bereavement of President F. J. MacStoker through the great loss of his sister.

Well, we certainly had two interesting talks on subjects worth while. The first meeting was on nickel formation, telling the difference of deposits. Also the R. P. M. of different size coloring wheels to use for nickel coloring. This was given by William Voss. The presenting of third prize paper, for colors upon metals, won by T. A. Gardner. Paper was presented to him by Mr. Straub.

Please let me present my thanks to award committee of convention held at Toledo, Ohio, through this means.

The subject presented at July 22nd meeting was the use of atomic and molecular weights, to find weight of metal in a compound. This paper or illustration was by J. Haas. Come on, fellow members of New York Branch, and keep up with the main object of this society of ours—advancement of electroplating. Probably you have something good to tell us, who knows? We don't need hat racks, but brains, to keep going.

THOMAS A. GARDNER, Rec. Secy.

DETROIT BRANCH

Regular meeting of the Detroit Branch, A. E. S., was held August 5th with the absence of the president and vice-president. Mr. Lovering was asked to take the chair, which he did willingly.

Minutes of the previous meeting were read and approved. One application was received and turned over to the board of maangers for investigation. Mr. Dupernell's transfer from the New York Branch has been accepted by our branch.

For the good of the order, chrome plating was the subject for the evening. Mr. Lewis passed around some very fine samples of this and started an all-round discussion on chrome plate.

Among the questions asked was Why does a chrome deposit show up all imperfections, such as wheel marks, scratches, etc., although the article looked good when nickel buffed?

The question was answered by the fact that when a piece of work was nickel buffed there may have been some slight imperfections which could not be noticed with the naked eye. The dirt from the buff may have a tendency to fill up the scratches, so they are not noticeable after buffing, and the fact that chromic acid is such a good cleaner it renders the surface perfectly clean, and for that reason the chrome deposit shows up all the defects. C. MASCOLA, Secy.

CLEVELAND BRANCH

Cleveland Branch had their picnic yesterday at Puritas Springs Park and the attendance would put any meeting to shame. Well, it was better to get them out some way. We had some races and a very exciting time. The girls' race, for girls up to 12 years of age, was won by May Workman, Catherine Scott 2nd, Helena der Doest 3rd. We had a single ladies' race which was won by Miss Edna McCormick, with her sister, Agnes McCormick, a close second and Muriel der Doest third. A boys' race went to Kenneth Singler and Robert Peterjohn second, and a men's race brought R. McCormick in first and Louis Singler second. Then the big thing was the members' race which was won by W. D. Scott, N. E. Jadowski second and McCormick, our worthy president, last, but the best race was one when you had to take one of your shoes off at the beginning and take the other one off at the half way post and carry it back to the first shoe and put both shoes on, and here is where one of our guests from Newark took the money, Mr. F. W. Matts taking first, Mr. Singler second and McCormick third. While our President McCormick is not very good at coming in any place but third, he certainly has some girls who are the real goods; also the boy.

Now the big thing, of course, was the ball game in which Kenneth Singler's team beat R. McCormick's aggregation. Well, we had some trouble getting started as Kenneth Singler, who was our star last year, held us up a la Babe Ruth. We thought he was going to ask for at least $100,000 or he would not start play. Well we got that all fixed up and then we had so many ladies who wanted to play so we had to give in and let them play, and to say the least, Edna McCormick, as catcher on Kenneth's team, won the game for that side. I suppose if she sees this she will want a million to play next year. We are not going to say anything about the score as we are not in a position to get any one sore at us. H. J. DER DOEST.

PITTSBURGH BRANCH

Our meeting of Saturday, August 6th, was the first since the Toledo Convention and proved to be one of the most interesting meetings. The report of the delegates to Toledo was read by the secretary and was well received. Many of the members who could not attend this year said that they would not miss the next one to be held at Toronto. After the usual business was taken care of, we elected to associate mem-

bership Mr. John A. Rumberger, 505 Fulton Building, Pittsburgh, Pa. Mr. Erwin Sohn, who was recently transferred from Chicago Branch, was present and gave the members present a very good lecture on Chromium Plating, which he illustrated by the use of the black board. This lecture was the best the members have heard, and a vote of thanks was given Mr. Sohn for this talk, and it is hoped that we will have many more such talks. The discussion that followed lasted until a late hour, and everyone was sorry that the questions could not be carried on further. Mr. Sohn is going to give us more of these talks and the members better take a hint and attend every meeting of the future, for they are going to miss many good things.

STANLEY E. HEDDEN, Secy.

BRIDGEPORT BRANCH

Meeting held in our rooms at 62 Cannon Street. President Tayette Lancaster opened the meeting at 8:15. The roll call of officers was read, three officers being absent. Communication and bills were read. There was some doubt whether we were going to hold our annual outing, but President Lancaster took a vote on it and the majority wanted to hold one. The committee appointed were George Wagstaff, chairman, George Karl, William Flaherty, William Straton and John Oberender, so a good time can be expected when we pick a committee like this one. The chairman gives the committee full power in selecting time and place for the outing.

Mr. Ray O'Connor gave us a very interesting talk on what took place at our annual convention. It made all brothers wish they could attend these conventions. He spoke mostly on Chromium Plating. We also had with us one of our members who doesn't get here as often as he used to (which is on account of working out of town). Mr. Slattery also gave us a very interesting talk on Chromium Plating. He said he took it up at the Columbia University in 1922 with Du Tink, and since then it has taken quite a step forward.

The treasurer's report was read and accepted. Meeting came to a close at 10:30. WILLIAM EHRENCRONA, Sec.-Treas.

NEWARK BRANCH

President Chas. H. Bohler opened the Aug. 5, 1927, educational meeting of Newark Branch with 24 members present. Routine of business being quickly put through, Mr. Glickenhaus, our librarian, read a paper on "Copper Solutions," finally recommending the use of carbonate of copper, carbonate of potash, sodium cyanide, ⅛ oz. caustic soda per gallon, 2 oz. free cyanide, 2 oz. metallic copper for a soft deposit of copper. When oxidizing copper deosits, hyposulphate of soda should not be used in copper solutions.

Mr. Sizelove advocated a low free cyanide content (about ½ oz. per gal.) in cyanide copper solutions when the deposit is to be oxidized. Messrs. Bohler, Sizelove, Onksen and Calabrese spoke on the subject of oxidizing copper deposits containing "hypo." The concensus of opinion was that hyposulphite of soda should not be used in cyanide copper solutions if the deposit is to be oxidized with potassium sulphuret. ROYAL F. CLARK, Sec.-Treas.

CHICAGO BRANCH

The regular monthly meeting of Chicago Branch was held August 13, 1927, at Atlantic Hotel. The meeting was called to order by President Meyers, and as the meetings are always full of interest, the attendance is always good.

Chicago Branch had the honor of having Past Supreme President Musick as a visitor. President Meyers called upon Past President Musick for a few remarks and Chicago Branch hopes to have the pleasure of having Mr. Musick pay us a visit again in the near future.

President Meyers then called upon another visitor, Mr. E. Woodmansee of Detroit Branch. There being one of the old timers at the meeting, President Meyers called upon Mr. Elliott for remarks.

Chicago Branch is going to form a club that will be known as the Old Timers Club and they will meet every second Saturday of each month at the Atlantic Hotel.

The charter will be open only to such time when all the old timers will attend every meeting of Chicago Branch, so you old timers get busy before it is too late.

There being no further business, the meeting was turned over to the Librarian and the following questions were in the question box:

Ques. 1. What is a good coating for plating rack to protect them from a deposit other than a baked process?

Ans. 1. Was told where such material could be purchased.

Ques. 2. What is the material used in plating banek other than wood?

Ans. 2. It was agreed that Bakelite was best.

Ques. 3. What is a good brightener for a nickel solution?

Ans. 3. Cadium sticks were suggested but operator must use own judgment as to the amount to be used as too much will turn nickel dark, also cause streaks. It was agreed that to agitate the work best results are obtained.

Ques. 4. What causes lacquer to peel from bright silver more than from brushed silver?

Ans. 4. Wash work in solvent, use a cotton lacquer with a small amount of gum.

Ques. 5. What is the best method of applying silver to clock dials by hand?

Ans. 5. Librarian stated he has formula if member would ask for it, as he has forgotten the proportion of formula.

Ques. 6. Will mercury added to a solution as a brightener cause any brittleness of deposit?

Ans. 6. Not if any more than 1 or 2 per cent is added.

Ques. 7. Is it advisable to plate a heavy deposit of nickel over a heavy deposit of copper that has not been buffed?

Ans. 7. Thought copper could not be deposited smooth enough to make good job. Was agreed that to buff copper would make better job and save material.

NEWARK BRANCH

The business meeting held on September 16 was well attended; 26 members and 2 visitors.

Vice-President George Wagner occupied the chair. Minutes of the previous meeting were approved as read. The outing committee reported that instead of holding a clam bake, a social affair would be held in the meeting hall at some near future date. It was voted to again start a chemistry class in Essex County Vocational School in October, and the secretary instructed to send a letter to each member, requesting them to register at the school. Mr. Oliver J. Sizelove will be the instructor.

Supreme Secretary-Treasurer George Gehling was present and gave a short talk on matters appertaining to the A. E. S. employment bureau, and the duties of the Supreme Secretary-Treasurer.

The Deposition of Chromium was the topic for discussion again. Mr. Onksen exhibiting a deposit of chronium on steel, of a week's duration. A file was passed around with the chromium deposit, but not one of the 28 members could make a scratch on the deposit.

Mr. Horace Smith recommended the following strip for chromium: One gallon water, 1 pound cyanide, ⅛ pound caustic soda. Reverse current.

Mr. Gehling read an article on "Ball Burnishing" from the "Proceedings of the 1927 Convention." Meeting adjourned 10:30 p. m.

ROYAL F. CLARK,
Secretary-Treasurer.

On Friday, September 2, Newark Branch held its educational meeting in Franklin Hall with 22 members present. President Chas. Bohler in the chair. Committees on "Shore Dinner" and "Convention Fund" reported progress. Articles on chromium plating were read from the "Proceedings of the Convention" (a 52-page volume).

Messrs, Sievering, Onksen, Stein and Carlson, who are operating chromium baths, spoke during the discussion on chromium plating. The reading of articles from the "Convention Proceedings" will be continued until all have been read and discussed. Newark Branch members are again urged to attend regularly and take part in the discussions. A few Newark members, since changing their address, have not been receiving their "Reviews."

PHILADELPHIA BRANCH

On account of vacation time the meeting of the branch was held September 9 with a good attendance. President George Gehling presiding. The subject for the evening, Chromium Plating, was presented by Mr. Scott, who explained the method and told of the many articles which are now being chromium plated.

The chemistry class is open in the Kensington Evening High School, Coral and Cumberland streets, open to all those interested in electro plating. Classes are held Monday, Tuesday, Wednesday evening, 7:30.

Annual banquet of the branch will be held November 19.

DETROIT BRANCH

Regular meeting of the Detroit Branch, A. E. S., was held September 2, and with a very small attendance; the members, no doubt, took advantage of the last holiday of the season. One applicant was elected to associate membership.

Mr. C. E. Marker's transfer from the Cleveland Branch has been accepted by our branch.

After that we had a little discussion on chrome plating, and the meeting was adjourned at an early hour.

CHAS. MASCOLA, Secy.

PITTSBURGH BRANCH

We held our monthly meeting Saturday evening, September 3, and on account of poor attendance not much was doing. We received the application of Mr. Harold K. Work, research chemist, 6139 Jackson street, East End, Pittsburgh, Pa., for membership as an associate member. We discussed plans for an active fall, and have several men listed for lectures, one for each of the monthly meetings. These lectures are to cover various plating problems, and can say that every member should take this notice and be on hand to hear and take notes, so as to obtain the information these men will give them.

CLEVELAND BRANCH

The Cleveland Branch had their meeting Saturday, September 3, 1927, but owing to it being the Saturday before Labor Day, when everyone generally goes somewhere for a two or three day trip, our attendance was very light. But Mr. McCormick was in the chair, and what the meeting lacked in numbers it certainly made up for with enthusiasm. Lead plating was the principal subject and our friend that asked the question about lead plating certainly went away satisfied that the A. E. S. is some help.

H. J. TER DOEST, Secy.

NEW YORK BRANCH

New York Branch held its regular meetings on August 12 and 26. Our vice-president presiding in absence of the president.

The first meeting we had formulas given for cleaning and plating iron and alum. Chromium solutions and racks used to plate articles in this solution were given at second meeting. Librarian E. Schor handles all discussions under Good and Welfare, and this proves to be an interesting feature of our meetings.

Now, members of New York Branch, I am going to ask you to come out and tell us something worth while and to help your officers make your branch what it should be; it is a good thing to pass an evening showing what we all know, as by using combined efforts we are going to progress and be able to show something for the other branches to aim at. By this I mean perfection. So come out and show yourself at least once a month. What say, fellows?

SUSPENSIONS	Branch
B. N. Drobin	New York
John Lama, 4746 Montana Ave	Chicago
P. H. Mueller, Waterloo, Iowa	Chicago
M. Icherarian, 1462 Bryan Pl	Chicago
REINSTATEMENTS	**Branch**
Jos. Hornwall, 399 20th Ave., Milwaukee, Wis	Milwaukee
RESIGNATIONS	**Branch**
H. T. Kiefer	New York
James Murphy, Chicago, Ill	Chicago
Wm. Ayton, Kenosha, Wis	Chicago
TRANSFERS	**Branch**
Richard Sliter, from Chicago Branch to	Cleveland
Chas. E. Marker, from Cleveland Branch to	Detroit
APPLICATIONS	**Branch**
M. Harold K. Work, 6139 Jackson St., East End, Pittsburgh, Pa.	Pittsburgh
Geo. F. P. Turner, 5324 Maple Ave., Pinilico, Baltimore, Md.	Philadelphia
Archibald Fleming, 2963 Fairhill St., Philadelphia, Pa.	Philadelphia
Wm. F. Schlep, 2259 N. Meade Ave., Chicago, Ill	Chicago
ELECTIONS	**Branch**
Wm. T. Harrison, 250 Second Ave., Newark, N. J.	Newark
Geo. E. Miller, 24 Belleville Ave., Belleville, N. J.	Newark
Gilman L. Parater, 1205 C St., N. W., Washington, D. C.	Philadelphia
John Calef, 1001 W. Van Buren St., care Automatic Electric Co.	Chicago
Michael Curr, 5108 W. 29th Pl	Chicago
Chas. A. Barrow, 1410 N. Dearborn St., Indianapolis, Ind.	Indianapolis
John A. Rumberger, care R. & H. Co., 505 Fulton Bldg., Pittsburgh, Pa.	Pittsburgh

ROCHESTER BRANCH

The regular meeting of the Rochester Branch was held August 19, 1927, at the Powers Hotel.

Charles Griffin, William Hart, Charles Hehr and Albert Cameron were appointed members of the Booster's Committee by President Lopez.

The annual picnic and outing held August 13 at Maplewood Inn developed some high class ball players. Captain Charles Griffin's team defeated Captain Sylvester Gartland's team in a nine-inning game by a 7 to 4 score. Time, 40 minutes. Umpire, Charles Puffer.

A number of members with their wives and friends were our guests from Syracuse and Buffalo, and Rochester Branch will be pleased to welcome our friends again.

The judges of the contests were: Mr. Carey, Mr. Todd, Mr. Adolph Newbeck.

Some very nice prizes, donated by Rochester firms, were presented to the winners of the contests.

SYLVESTER P. GARTLAND,
Secy. and Treas.

CHICAGO BRANCH

Regular monthly meeting, Chicago Branch, held September 10, 1927, at Atlantic Hotel.

Meeting called to order. President Meyers presiding.

The meeting was not as well attended as in the past, it being due to the hot spell that came over our city for a few days. The boys did not turn out as usual.

After the regular routines of business the meeting was turned over to the librarian, who found the following questions in question box:

Ques. 1—What causes cast brass to turn black when bright dipped?

Ans. 1—Too much lead in casting.

Ques. 2—Having trouble with screws eating off in any galvanizing barrel using acid solution. What, if any, is the remedy?

Ans. 2—Countersink screw holes and wax screws. Was suggested to have Momel metal screw made.

Ques. 3—What causes nickel solution to pit P. H. 5.8 to 6.0 and metal content of 3½ oz. per gal. especially after the addition of salt, P. H. remaining the same?

Ans. 3—It was suggested to use 2 or 3 oz. sodium sulphate to overcome pitting?

Ques. 4—Why is table salt added to a nickel solution?

Ans. 4—To give greater conductivity and throwing power.

Ques. 5—Can a chromium solution be replenished after being used for some time or must a new solution be made to get proper results?

Ans. 5—Held over until next meeting.

Ques. 6—What will etch bronze castings when the mixture is copper 87%, tin 7%, zinc 4% and lead 2%?

Ans. 6—Use regular etching solution as for brass.

Chicago Branch was honored in having Mr. Walter Allen, past supreme president and past editor, at the meeting, who gave a very interesting talk on chromium plating, also bringing greetings and good fellowship from Detroit and Grand Rapids branches.

NEWARK BRANCH

On Friday, August 19, Vice-President George Wagner opened our meeting with 19 members present. Two applicants were elected to active membership.

Messrs. Sievering and Smith gave a report on the Toledo convention.

The 152-page volume of the "Proceedings of the 1927 Toledo Convention" has been received and a portion of it will be read the meeting beginning September 2, and each member of Newark Branch is urged to attend the meetings and listen to the reading of the articles, also the discussions which follow. The entire volume is exceedingly interesting and those interested in chromium will be amply repaid for coming out to the meetings. The chair appointed a "Convention Fund Committee" (Messrs. Vaughan, Sizelove and Smith), which will report in one month on the starting of a fund for each member, that he may attend the 1928 convention in Toronto. Messrs. Sizelove and Smith were appointed a committee to arrange either a clam bake or fish dinner to be held in September.

Electric cleaners were discussed after our librarian read an article on the subject.

ROYAL F. CLARK, Secy.-Treas.